

CONSTRUCTION STANDARD SPECIFICATION

SECTION 16720

INTRUSION ALARM (IA) SYSTEM

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CONSTRUCTION STANDARD SPECIFICATION

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INTRUSION ALARM (IA) SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide materials, equipment, accessories, and workmanship as specified on Drawings. Work includes installation of conduit, conductors, field-testing, adjustments, device installation, wiring terminations, and the following:
 - 1. IA cabinet fabrication.
 - 2. Conduit and cable installation.
 - 3. Door switch installation.
 - 4. Tamper switch installation.
 - 5. Multiplexer (Mux) installation.
 - 6. Signal tests.
 - 7. Adjustments.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturers catalog data, specifications, and installation instructions for proposed substitutes of IA System equipment.
 - 1. Any substituted product shall have equivalent or better construction quality and performance ratings than what was specified.
 - 2. Electrical characteristics of substituted equipment shall match or exceed specified material.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide parts and components not specifically identified on Drawings, of materials most appropriate to their use or function, and resistant to corrosion, thermal stresses, and mechanical stresses encountered in normal application.

2.02 CABLE

- A. Field Wiring Of Alarm And Tamper Devices: 6 conductor #22 AWG (Belden Cat. # 9576).
- B. Loop Wiring: 6 pair #22 AWG (Belden Cat. #8768) cable for loop wiring for communications between Mux cabinet and the Central Alarm Station (CAS) or the Secondary Alarm Station (SAS).
- C. Other cables if required will be shown on the Drawings. No deviations from specified individual conductor color codes are permitted.

2.03 IA CABINET FABRICATION

- A. Fabricate multiplexer cabinet in Contractor's shop.
 - 1. Completed cabinets shall be tested and inspected in the shop by a representative of the SNL Electronic Security Department.
 - 2. Field install Mux cabinet(s) only after completion of acceptance testing by SNL Electronic Security Department representative.
- B. Label cabinet components using engraved labels, and mount to allow easy wiring termination and access to components for replacement. Label jumper cables to indicate destination terminal points.
- C. Mount battery charger to metal frame of cabinet in order to increase dissipation of heat generated by charger.
- D. Mux schedule relates field wiring to termination points in Mux cabinet.
- E. Paint terminal cabinet backboard white. Paint terminal cabinet's exterior and attached conduits to match color of wall that cabinet and conduits are mounted on.
- F. Provide service loop in cables prior to termination on punchdown blocks and devices to allow for easy disconnection or termination of conductors. Tape and insulate all unused conductors. Do not cut unused conductors, unless specified otherwise.
- G. The standard lightning protective device used is the PLUGTRAB made by Phoenix Contact, which consists of a base element (P/N #UFBK2-PE-12DC BE) and a plug component (P/N UFBK2-PE-12DC ST) mounted on standard DIN EN 50022 and DIN EN 50035 mounting rails. Ground the mounting rail with a green insulated #10 grounding conductor connected to the enclosure that contains the equipment.
- H. In the multiplexer cabinet, connect the positive (+) red wire for each vault room sensor in series using spade terminal lugs to connect to the left inner terminal prongs on Block F. Refer to IA Standard Drawing # TY 7009STD (old # 91303 E-13) for the designated termination locations on Block F. Connect the sensor power on/off switch between the sensor positive (+) series wiring on Block F and the positive (+) side of Block G.
- I. Terminate alarm device cables as indicated below:

1. Punchdown Block D

Starting at terminals D7 through D12, terminate field wiring from the alarm devices on Block D in the IA cabinet. Terminate all conductors of the cable in the following order: black, white, red, green, brown, and blue. Install a 5100-ohm resistor at all unused alarm channels.

To connect the positive (+) 12 Vdc sensor power, install a red #22 jumper wire from Block D and/or E to the designated terminal on Block F. On Block F jumper all +12 Vdc terminal points that are common to the same vault area and connect to the sensor power on/off switch.

2. Punchdown Block E

Terminate field wiring to door switches and sensors on the left side of the block and terminate field wiring to tamper and duress switches on the right side of the block. Install a 5100-ohm resistor at all unused alarm channels.

3. Punchdown Block F

Install #22 jumpers, as required, to Blocks D, E, G, and relays. The right side of Block F is used for termination of cable to the sensor power on/off switches.

4. Punchdown Block G

This block is the terminal point for 12 Vdc power in the cabinet.

- J. Jumper wiring between devices in multiplexer cabinets shall be a #22 solid conductor (Belden 8530 or equal), color-coded as noted on the IA Standard Drawings issued with the contract.
- K. Cabinet cable conductors are typically terminated on the outside terminal prongs on the punchdown block, leaving the inside terminal prongs available for field terminations. This arrangement reduces the possibility of nicking the cable terminated on the outside prong when punching down a new cable on the inside position of the prong bus.
- L. Do not punch down two conductors on the same terminal prong. Where more than one wire is required to be terminated on a single terminal prong (such as the sensor power positive (+) series connections on Block F), use spade terminal lugs that fit firmly over the terminal prong on the punchdown block.

2.04 CABINET FABRICATION FOR INSTALLATION IN TECH AREA III AND REMOTE SITES (All Areas South Of Tijeras Arroyo, Excluding Area V)

- A. The IA cabinet shall have a locking handle; tamper switch, and a white plywood backboard.
- B. Install the cabinet in an accessible location.
- C. Mount two terminal strips on the backboard, one for the alarm circuit and one for the tamper circuit.

- D. Install a 12 Vdc battery, a battery charger, and a Dorado modem.
- E. Install a 115 Vac receptacle in the IA cabinet to provide power to the battery charger that supplies power to the Dorado modem equipment. The Dorado modems and associated equipment are furnished and connected by Sandia Electronic Security Department.
- F. For new installations, install a six-conductor cable (Belden 9576) from the IA cabinet to each alarm detection device. Use the black and white conductor for the alarm circuit and the red and green conductors for the tamper circuit. For existing installations that use #18 conductors for alarm detection device wiring, use #18 conductors color coded purple for the alarm circuits and orange for the tamper circuits.

2.05 JUNCTION BOXES

- A. Attach covers to J-boxes with non-removable screws after cable installation. Install tamper switches in cabinets where IA wiring is terminated and in pull-boxes where cables other than IA cables exist or are anticipated. Install tamper switches in J-boxes containing IA cable terminations or splices.

PART 3 - EXECUTION

3.01 GENERAL

- A. Drawings: If actual locations, types, and sizes of intrusion alarm cabinets and devices installed by Contractor differs from that shown on Drawings, Contractor shall indicate changes on the Drawings. If conduit runs are not indicated, route conduit from field device to Mux cabinet.
- B. Comply with installation requirements of NEC.
- C. Devices shall be wired separately from other devices, unless otherwise noted.
- D. Damage to IA System equipment caused as a result of improper connections shall be the responsibility of Contractor.

3.02 CONDUITS AND CABLES

- A. Install cables in continuous lengths without splices, from device to terminal cabinet or terminal cabinet to terminal cabinet. Label cables indicating termination point. Terminate cables following color-coding shown on SNL Standard Drawing # TY7002STD (old # 91303 E4A).
- B. Size conduits and boxes using the following tables, unless otherwise specified.

CONDUIT FILL TABLE (Belden Cat. # 9576 Cable)	
Conduit Size - Inch (mm)	Maximum No. Of Cables
1/2 (12.7)	2
3/4 (19.1)	4
1 (25)	7
1-1/2 (38.1)	18
2 (50.8)	30
2-1/2 (63.5)	42
3 (76.2)	65
3-1/2 (88.9)	90

BOX-FILL TABLE (Belden Cat. # 9576 Cable)	
Box Size - Inch (mm)	Maximum No. Of Cables
4 Square x 1-1/2 (101 Square x 38.1)	5
4-11/16 Square x 1-1/4 (119.1 Square x 31.8)	6
4-11/16 Square x 2-1/8 (119.1 Square x 54.0)	10
FS	3
FD	4
6 x 6 x 4 (152 x 152 x 102)	36
8 x 8 x 4 (203 x 203 x 102)	51
12 x 12 x 6 (305 x 305 x 152)	150

- C. Conceal conduits unless otherwise noted, and install parallel or perpendicular to building lines.
- D. Route all IA system wiring in conduit. Cables connected to sensors in vault rooms may be soft-wired if it can be done in an aesthetic manner. Door mullions may be used as cable raceways if they are made inaccessible with the use of one-way screws after cable installation.
- E. Install IA system cables in a dedicated raceway not shared with other system cables with the exception of Access Control cables. IA cables may be routed with other communication cables in underground ducts but must be separated into a dedicated IA raceway at the service entrance to the building.

3.03 DOOR SWITCH INSTALLATION

- A. Insulate splices and wiring within switch housing to prevent shorting. Coil and insulate unused conductors with electrical tape.
- B. Test door switch to ensure proper operation. Employ the following procedures during installation and tests:
 - 1. Mounting: Remove switch from housing prior to mounting and avoid damage to switch. Locate reed switch at bottom of switch housing facing toward

magnetic housing. Refer to SNL Standard Drawing # TY5001STD (old # 91303 E1) for typical door switch mounting detail.

- a. Mount switch and magnetic housing to door and doorframe with a 3/8-inch (9.5-mm) separation between the two housings.
 - b. Mount magnet on metal doors and doorframes by using plastic spacers or aluminum angle brackets between housing, and door and frame surfaces.
2. Internal Bracket Adjustment: Verify position of switch internal bracket assembly using gage or ruler. Upright portion of bracket assembly shall be within 1/2 inch (12.7 mm) from outside edge of raised portion of rubber gasket.
- a. Tighten the two-hex/slot head screws holding internal bracket assembly in position, using 1/4-inch (6.35-mm) offset wrench.
- C. Replace factory issued screws with #6-32 x 1.5-inch, snake-eye type screws, on switches mounted to regular doors or roll-up doors.

3.04 DOOR SWITCH ADJUSTING

Perform bias magnet adjustments without resistors installed. Refer to SNL Standard Drawing # TY5003STD (old # 91303 E3) for illustration of bias magnet adjustment.

- A. Open protected door to remove main magnet field.
- B. Set multimeter on RX1 scale, and connect across switch terminals 2 and 3.
 1. If closed-circuit reading registers, move bias magnet located above reed switch toward tamper switch. Bias magnet will slide in clamp bracket. Move bias magnet until switch provides open-circuit reading.
 2. If open-circuit reading registers, move bias magnet further away from tamper switch mount until closed-circuit reading is achieved. Move bias magnet slowly back until open-circuit again registers. This adjustment is close to the most sensitive position of the bias magnet.
- C. Close protected door. Meter should register closed circuit.
- D. Slowly open door. Meter should register an open circuit (alarm) when the door has moved between 3/4 inch (19.1 mm) and one inch (25 mm) from the fully closed position.
- E. Slowly close door. Meter should register a closed circuit (secured) before the door is 1/8 inch (3.18 mm) from fully closing.
- F. Carefully adjust bias magnet position until switch operates within limits stated in Part D and E above. (Switch becomes more sensitive when bias magnet is moved toward tamper switch and less sensitive when magnet is moved away from tamper switch).

- G. When satisfactory adjustment is obtained, remove multimeter. Terminate door switch wiring per details in SNL Standard Drawing # TY5004STD (old # 91303 E7), and install resistors. Replace switch housing.

3.05 TAMPER SWITCH INSTALLATION

- A. Align tamper switch(es) in J-boxes, pullboxes, and cabinets to maintain solid, consistent contact with cabinet door(s) or cover(s). Provide PVC tubing around tamper switch when installing tamper switch in terminal cabinets, to prevent defeat by insertion of a foreign object.
- B. Attach covers to intrusion alarm J-boxes, pullboxes, flex connectors, and LBs with one-way screws after cable installation, unless alarmed with tamper switch.
- C. Install a two-conductor #22 cable (Belden 8795 or equal) from the IA multiplexer cabinet to each J-box tamper and duress switch.

3.06 IA CABINET AND MULTIPLEXER INSTALLATION

- A. Mounting of IA cabinets are not to exceed 6' - 6" (1.98 m) from the floor to top of cabinet, unless otherwise noted on Drawings.
- B. Stellar multiplexers installed in IA cabinets shall be installed on multiplexer brackets mounted to cabinet backboard.
 - 1. See SNL Standard Drawing, # TY5005STD (old # 91303 E14) for fabrication details for mounting brackets.
 - 2. Securely fasten multiplexers mounted to IA cabinet door using #8-32 pan head screws and locknuts.
 - 3. Space multiplexers to allow room for accommodating additional components and associated wiring.

3.07 TESTING

- A. Signal tests listed below apply to each door switch, and infrared and microwave sensor reporting to a Stellar multiplexer.
 - 1. Disconnect alarm input 18-pin connector "B" from Stellar multiplexer.
 - 2. Connect multimeter across pins on connector corresponding to channel of door switch/sensor. Pin numbers will be one of the following:
 - Channel 1: Pins 2, 3
 - Channel 2: Pins 4, 5
 - Channel 3: Pins 6, 7
 - Channel 4: Pins 8, 9
 - 3. Place door switch/sensor in secured state (e.g., door closed, sensor activated). Measured resistance should be 5.15 k Ohms +/- 50 ohms.

4. Place door switch/sensor in an alarm condition (e.g., open door, trigger sensor). Measured resistance should be 6.45 k Ohms +/- 60 ohms.
 5. Remove door switch housing (for sensor, dislodge from its mounting) to simulate a tamper alarm. Measured resistance should be infinity (open circuit). Replace door switch housing (or remount sensor).
 6. Ground one lead of multimeter to cabinet, the other to the multiplexer housing. Verify that open circuit exists between cabinet ground and each pin tested in Steps 2, 3, and 4 above.
 7. Plug connector back into Stellar multiplexer.
- B. Perform tamper and duress switch test for each switch reporting to a Stellar multiplexer.
1. Disconnect alarm input 18-pin connector "B" from Stellar multiplexer.
 2. Connect multimeter across pins on connector corresponding to channel of tamper/duress switch. Pin numbers will be one of the following:

Channel 1: Pins 2, 3
Channel 2: Pins 4, 5
Channel 3: Pins 6, 7
Channel 4: Pins 8, 9
Channel 5: Pins 10, 11
Channel 6: Pins 12, 13
Channel 7: Pins 14, 15
Channel 8: Pins 16, 17
 3. Place tamper/duress switch in secured state (e.g., terminal cabinet door closed). Measured resistance should be 5.15 k Ohms +/- 50 ohms.
 4. Place tamper/duress switch in alarm condition (e.g., open terminal cabinet door, operate duress switch). Measured resistance should be infinity (open-circuit).
 5. Plug connector back into Stellar multiplexer.

3.08 FINAL ACCEPTANCE

- A. Notify SDR for final acceptance testing. SDR shall arrange for acceptance testing to be performed by representatives from SNL Electronic Security Department. Final testing report shall be made available to SDR.

END OF SECTION 16720